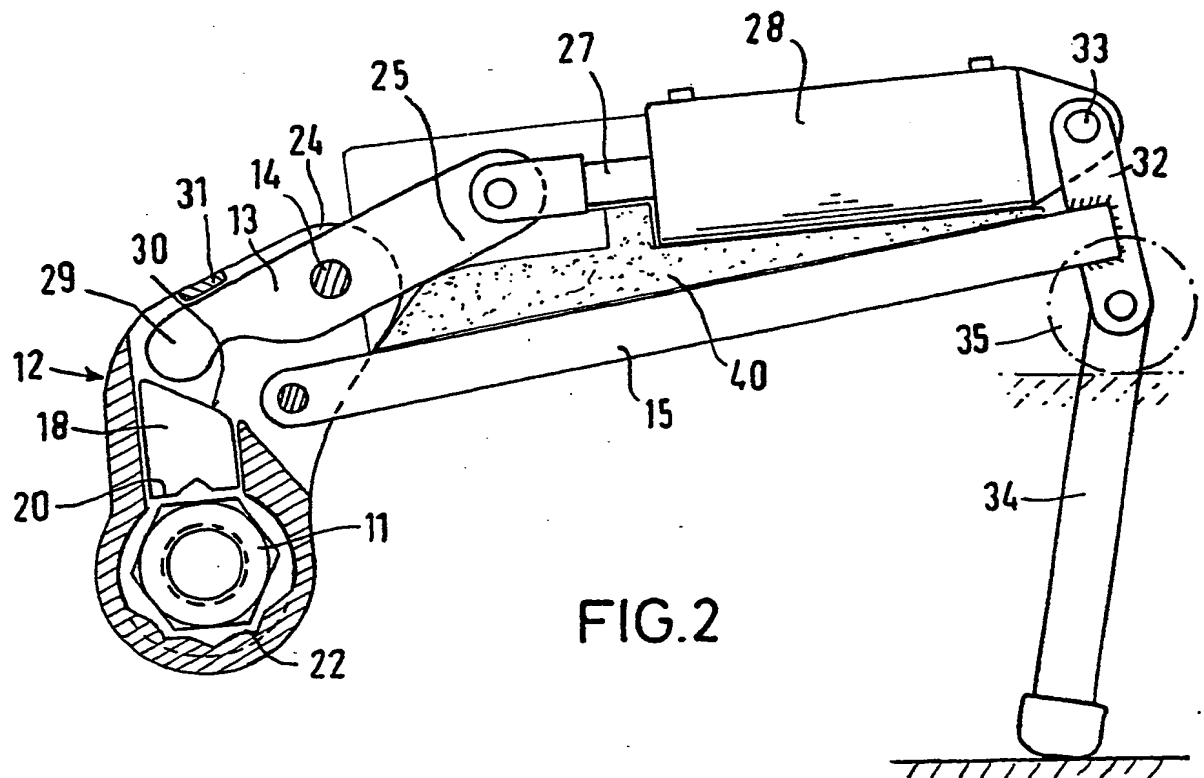
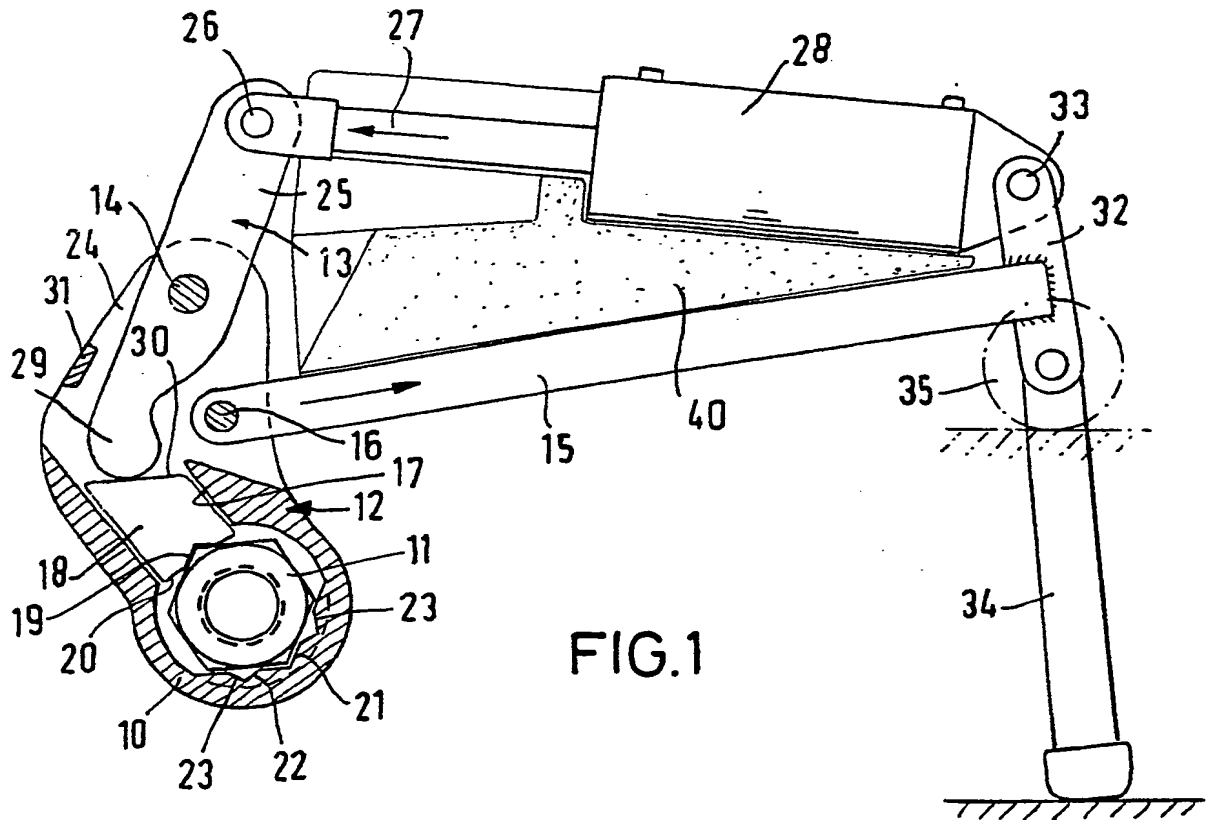


- opposite direction. The holder 12 and the lever 13 with or without the slide 18 may be used as a hand tool or a drive unit 27,28 may be used to apply torque to the object and the drive unit may be hydraulically operable. A reaction lever 15 is pivoted to the holder 12 or to the lever 13 radially inward of the pivot 14 between the lever and the holder. The space between the drive unit and the reaction lever 15 is taken up by elastomeric material for safety.





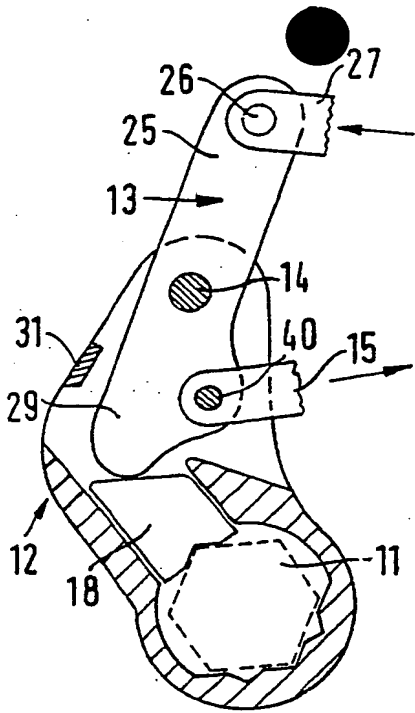


FIG. 3

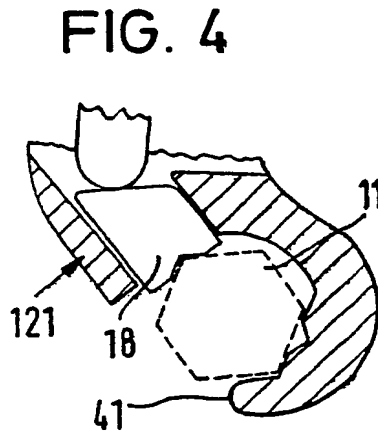


FIG. 4

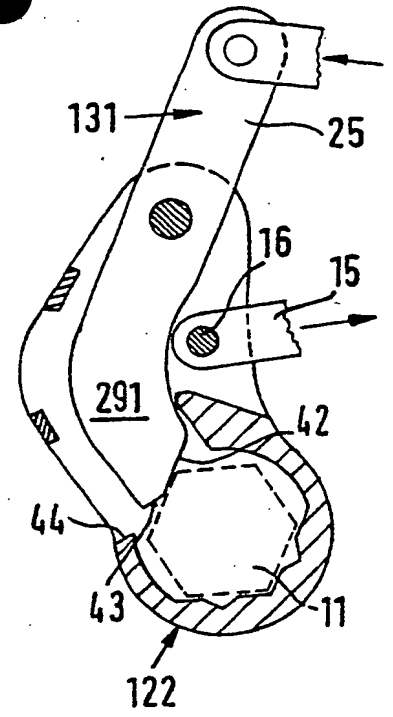


FIG. 5

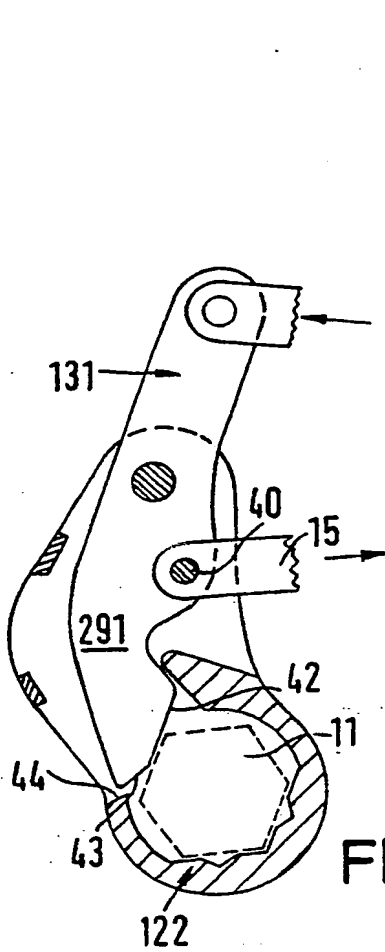


FIG. 6

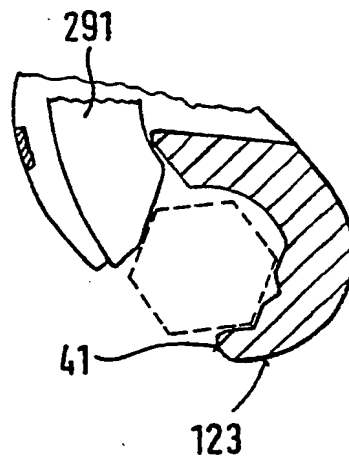


FIG. 7

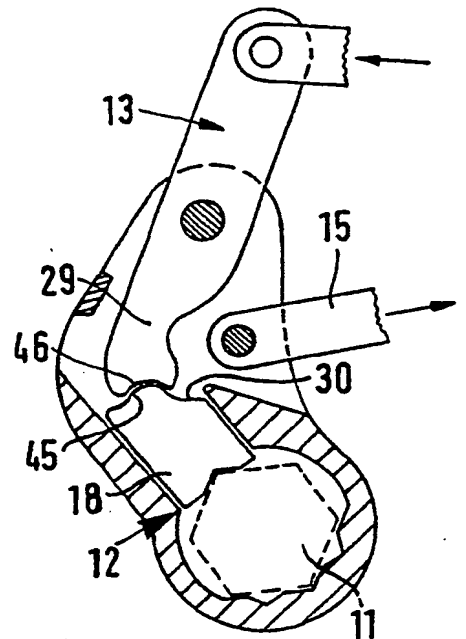


FIG. 8

## SPECIFICATION

## A Unidirectionally Torque-Appling Wrench

The invention relates to a unidirectionally torque-applying wrench.

- 5 There are known unidirectionally torque-applying wrenches in which a lever is moved to and fro either manually or by means of a drive unit and in which the holder enclosing the object to be rotated entrains the object in the one sense of rotation to subsequently return without it. Such rotary tools are designed e.g. as ratchets comprising a catch engaging in the teeth of a blocking wheel, or they have a clamping tape, which, upon swivelling the lever, is tensioned in the direction of entrainment.

- 15 With respect to ratchets, the ring enclosing the object must be rather strong due to the required blocking wheel. This is a disadvantage with heavy-duty equipment operating with high power, because the ring must be very broad. Such a rotary tool calls for a great distance of operation, in other words, it can be only applied e.g. to screws which have a certain distance from other constructional elements.

- 25 It is the aim of the invention to provide a unidirectionally torque-applying wrench consisting of a few elements and comprising a ring enclosing the object to be turned which ring has a thickness as small as possible.

- 30 According to the invention there is provided a unidirectionally torque-applying wrench comprising a holder adapted to enclose at least partly an object to be turned, and a lever pivoted to the holder, the lever being movable in one direction either directly or via a slide to engage the object and turn same and in the opposite direction to release the object.

- 40 Embodiments of the invention will now be described, by way of example, with reference to the accompanying drawings, in which:—

- Figure 1 is a longitudinal section through a free-running unidirectionally torque-applying wrench for turning screws, the drive unit being hydraulic and the piston thereof being in the maximum stroke position;

- 45 Figure 2 shows the rotary tool of Figure 1 in the return position of the piston;

- Figure 3 shows another working example in which, different from Figures 1 and 2, the guide connected with the casing of the drive unit is not attached to the holder but to the second lever arm of the lever;

- 50 Figure 4 shows an embodiment in which the holder is designed as an open-ended spanner;

- 55 Figure 5 shows a working example similar to that of Figures 1 and 2, but without a slide;

- Figure 6 shows a working example similar to Figure 3, but without a slide;

- Figure 7 shows an embodiment according to 60 Figures 5 and 6 as an open-ended spanner; and

- Figure 8 shows an embodiment similar to that of Figures 1 and 2, but with the lever engaging a cap-shaped pressure piece of the slide.

The illustrated rotary tool has a ring 10, which

- 65 is placed about the hexagonal screw head 11 to be turned. Ring 10 is an element of holder 12, at which the lever 13 with a cross pin 14 and the guide 15 with a cross pin 16 are rotatably supported.

- 70 Guide channel 17 ends in the ring 10 in which channel the slide 18 there is a recess 19 whose angle is  $120^\circ$  corresponding to the edge of the hexagonal screw head 11. The recess 19 only engages one edge of the screw head 11 and it is limited by a plane face 20 extending perpendicular relative to the direction of displacement of the slide 18.

- A similar recess 21 whose angle also corresponds to the angle of the screw head edge is at ring 10 on the side opposite to the slide 18. The recess 21 is also limited by a face 22 extending transversely relative to the sliding direction of slide 18. The flat areas 23 adjoin laterally face 22 at an angle of  $120^\circ$  each.

- 85 The screw head 11 can be engaged by the slide 18 in the manner shown in Figure 1 so that one screw head edge projects into the recess 19 and the opposite screw head edge into the recess 21. If the slide 18 is pressed in the direction towards the screw head, the screw head retained in the ring may be turned concomitantly by turning ring 10.

- Figure 2 shows another possibility of clamping the screw head 11. The plane face 20 of the slide 95 and the plane face 22 of the ring engage two opposite faces of the screw head so that it is retained in the ring and cannot rotate if a pressure is exerted on slide 18.

- The holder has an extension 24 projecting from 100 ring 10 and acting as a lever arm for the turning of the ring. At the outer end of the extension, there is the cross pin 14 at which the lever 13 is supported.

- At one lever arm 25 of two-arm lever 13, the 105 piston rod of the piston-cylinder unit 28 is attached via a hinging pin 26. The other lever arm 29 projects into the inside of holder 12 and can be swivelled there. The end of the lever arm 29 is rounded and can press against the rear inclined face 30 of slide 18.

- The guide 15 hinged with the cross pin 16 at the holder 12 as near to the ring 10 as possible is welded with its outer end to a rod 32 which is connected via an articulation 33 with the casing of the piston cylinder unit 28. The other end of the rod 32 is connected with a pendulum support 34 put on a stationary support or connected with a support wheel 35. The type of support is dictated by the prevailing local conditions.

- 120 It be supposed in the instant case that the screw head 11 shall be rotated anticlockwise. Thus, it must be entrained, when the piston rod 27 is removed out of the piston-cylinder-unit 28. If the piston rod 27 is shifted to the left side, the lever arm 29 and the slide 18 press against the screw head clamped accordingly between the recess 19 and 21 (Figure 1) or between the faces 20 and 22 (Figure 2). Upon an additional movement of the piston rod 27 to the left side,

the holder 12 is turned together with the screw head 11 about its axis of rotation. At this occasion, the piston rod 27 causes a thrust to the left, while the guide 15 is drawn to the left due to the reaction force exerted on the piston-cylinder unit 28. The leverage applied by the piston rod 27 to the screw head is much greater than the leverage applied by the guide 15 so that the screw head rotates anti-clockwise. The remaining component of the reaction force is carried away via support 34 or 35.

If the screw head is to be turned clockwise the same tool may be used in reversed direction.

In the illustrated working example, a rotation of the screw head 11 by  $30^\circ$  is effected with each stroke of the piston-cylinder unit. The stroke of the piston 27 must however be big enough to ensure that the angle covered is greater than  $30^\circ$  with respect to the axis of the screw head 11, because a play for the movement of the lever 13 inside the holder 12 must be available additionally.

In the instant working example, cross pin 16 is nearly on the same radius—based on the screw head 11—as the pivot point 26.

This is necessary for saving space and to obtain a range of ring 10 as large and free as possible. If such a free range is not required, the pivot point 16 is suitably at a site offset clockwise relative to the illustrated positions so that the traction force caused in the guide 15 when the piston rod 27 is retracted, can be used to support the anti-clockwise rotation of the screw head 11.

To avoid injuries, the angular range between the casing of the piston-cylinder unit 28 and the guide 15 is filled with a key 40 of elastomeric material which prevents the hand from being engaged in this range, but which, by its compressibility, does not interfere with the movements of the system.

The piston-cylinder unit 28 is connected, in a manner known *per se*, to a hydraulic or compressed air source and by a reversing valve, it is reversed periodically so that the piston makes a to-and-fro movement, up to the final stop.

The working example of Figure 3 is similar to that of Figures 1 and 2 and the parts which are substantially identical are provided with the said reference numerals.

Unlike the preceding working example, the guide 15 is not attached to the holder 12, but to the second lever arm 29 of the lever 13. It is connected with the lever arm 29 by an articulating pin 40. If the screw head 11 shall be rotated anti-clockwise forces in direction of the arrows are applied by the piston rod 27 and the guide 15. As a result, the lever 13 is turned about its pivot point 14 in anti-clockwise direction, and the pressure piece 18 is firmly pressed against the screw head 11. Moreover, a torque is applied the holder 12 via the pivot point 14 about the screw head 11 in anti-clockwise direction so that the holder is turned in the desired direction and the screw head is entrained. When the piston rod 27 is retracted into the cylinder 28, the pressure and

traction forces in the rods 15 and 27 are reversed, the lever 13 comes to abut against the stop 31 and the slide 18 is released from the screw head 11.

In the working example of Figure 4, the holder 121 is designed as an open-ended spanner. It has a lateral aperture 41 and may be removed from the screw head 11 by lateral displacement if the slide 18 is in return position.

Working examples of Figures 5 and 6 do not comprise a slide. The outer lever arm 25 of the lever 131 is unchanged as compared to the preceding working examples; the inner lever arm 291 is elongated and curved so that its lower front face directly presses against the screw head 11. The lower front face consists of two plane areas 42, 45 extending relative to each other at an angle of  $30^\circ$ . Both areas 42 and 43 alternately engage at one of the hexagonal faces of the screw head 11. The holder 122 has a lateral aperture 44 through which the lever arm 291 may project to the outside upon its return from the screw head 11. Working examples 5 and 6 are different from each other in that in Figure 5 the guide 15 is attached at the pivot point 16 to the holder 122 while, in Figure 6, it is attached at the pivot point 40 to the inner lever arm 291 of the lever 131.

Figure 7 shows a modification of working examples 5 and 6, the holder 123 having a lateral aperture 41 to permit its removal from the screw head like an open-ended spanner when the lever arm is swivelled back. Of course, the holder may be applied to the screw head in the same manner.

The working example of Figure 8 corresponds to Figures 1 and 2 except that a cap-shaped pressure piece 45 is provided on the surface 30 of the slide 18, while the inner lever arm 29 has an arcuate recess 46 pressing against the pressure piece. The pressure piece 45 as well as the recess 46 may be surface-hardened to better withstand the stresses occurring.

To clamp the screw head, two or more slides may be provided, if necessary, which are actuated synchronously by the lever 13 and which slide in separate guide channels meeting each other in key-shape.

It is possible to adapt at the end of the lever a roller sliding at the rear face of the slide to reduce the friction between the lever and the slide. The slide may be also hinged at the end of the lever so that it forms a toggle lever system together with the lever.

The invention is suitable for hand tools, its use also being particularly favourable with the application of higher torques in connection with drive units, because the smaller dimensions of the ring enclosing the object to be rotated involve the greatest advantage.

The lever or holder may be detachable from the elements of the drive unit to make a manual rotation in the easy motion range of the screw head to be turned. The holder and the lever may be actuated manually until the torque to be applied becomes too great for manual application.

Only then is the drive unit coupled and the screw head is further turned stepwise by the driving unit.

#### Claims

1. A unidirectionally torque-applying wrench comprising a holder adapted to enclose at least partly an object to be turned, and a lever pivoted to the holder, the lever being movable in one direction either directly or via a slide to engage the object and turn same and in the opposite direction to release the object.
2. A wrench according to claim 1, wherein the lever is movable in the one direction via a slide to engage the object.
3. A wrench according to claim 2, wherein for the turning of screw heads the slide has a recess corresponding to the angle of one screw head edge.
4. A wrench according to claim 3, wherein the holder has a recess corresponding to the angle of a screw head edge and at the side opposite to the slide.
5. A wrench according to claim 4, wherein the recesses are each in the centre of a plane area which extends at least approximately rectangularly relative to the direction of movement of the slide.
6. A wrench according to any one of claims 2 to 5, wherein the slide has an inclined face at its rear end for engagement by one end of the lever.
7. A wrench according to any one of the preceding claims, wherein the lever is hinged to a retractable portion and the holder is hinged to the casing of a driving unit.
8. A wrench according to any one of claims 1 to 6, wherein one lever arm of the lever is hinged to a retractable portion of a driving unit and the other lever arm is hinged to a guide whose other end is hinged to a casing of the driving unit.
9. A wrench according to claim 7 or 8, wherein the lever or the holder can be detached from the elements of the driving unit to permit a manual rotation in the easy motion range of the object to be rotated.
10. A wrench according to any preceding claim, wherein the holder encloses the object like a ring spanner.
11. A wrench according to any one of claims 1 to 9, wherein the holder partly encloses the object like an open-ended spanner.
12. A unidirectionally torque-applying wrench substantially as hereinbefore described with reference to Figures 1 and 2 of the accompanying drawings.
13. A unidirectionally torque-applying wrench substantially as hereinbefore described with reference to Figure 3 of the accompanying drawings.
14. A unidirectionally torque-applying wrench substantially as hereinbefore described with reference to Figure 4 of the accompanying drawings.
15. A unidirectionally torque-applying wrench substantially as hereinbefore described with reference to Figure 5 of the accompanying drawings.
16. A unidirectionally torque-applying wrench substantially as hereinbefore described with reference to Figure 6 of the accompanying drawings.
17. A unidirectionally torque-applying wrench substantially as hereinbefore described with reference to Figure 7 of the accompanying drawings.
18. A unidirectionally torque-applying wrench substantially as hereinbefore described with reference to Figure 8 of the accompanying drawings.